

EPO - DG 1

15

24. 01. 2001

CLAIMS

(40)

1. A radio frequency (RF) receiver circuit (2) comprises: an antenna (8, 28) for receiving a radio frequency (RF) signal (4) and is characterised by an optical detector (10) for receiving a modulated optical signal (12) and converting it to an electrical signal; means (14) for mixing the electrical and RF signals to produce an intermediate frequency signal; and a reflective optical modulator (16) which is operable at the intermediate frequency to modify and reflect (24) the optical signal (12) with the intermediate frequency.
2. A radio frequency receiver circuit according to Claim 1 and characterised in that the means (14) for mixing comprises a non-linear radio frequency component.
3. A radio frequency receiver circuit according to Claim 2 and characterised in that the non-linear component (14) comprises a transistor.
4. A radio frequency receiver circuit according to any preceding claim and characterised in that the optical receiver (10) comprises a photodiode.
5. A radio frequency receiver circuit according to Claim 4 when dependent on Claim 1 or Claim 2 and characterised in that the non-linear radio frequency component (14) comprises the photodiode (10).
6. A radio frequency receiver circuit according to any preceding claim and

characterised in that the reflective optical modulator (16) comprises a piezoelectric acoustic resonator.

7. A radio frequency receiver circuit according to any preceding claim and further characterised by comprising means (18) for directing a part (12a) of the optical signal (12) onto the optical detector (10) and a part (12b) onto the reflective optical modulator (16).

8. A radio frequency receiver circuit according to any preceding claim and characterised by the optical detector (10) being located on the reflective surface (22) of the reflective optical modulator (16) such that the optical signal (12) is simultaneously incident on both the reflective optical modulator (16) and optical detector (10).

9. A radio frequency receiver circuit according to any preceding claim and further characterised in that the circuit (2) is operable to transmit a radio frequency signal (38) from the antenna (8, 28) and wherein the frequency of said transmitted signal (38) is related to the modulation frequency of the optical signal (12).

10. A radio frequency receiver circuit according to Claim 9 and characterised in that it is capable of simultaneously transmitting (38) and receiving (42) a radio frequency signal.

11. A radio frequency receiver circuit according to any preceding claim and further characterised by a photodiode (34) connected to the antenna (8, 28) such that the resonant

PCT/GB00/00044

frequency of the antenna (8, 28) can be remotely tuned by using the optical signal (12, 36) to set the capacitance of the photodiode (10, 34).

12. A radio frequency receiver circuit according to Claim 11 in which the photodiode (34) comprises the optical detector (10).

13. An interrogator circuit (44) for use in a tagging system which uses semi-passive transponders (40) and characterised by incorporating a radio frequency receiver circuit (2) according to Claim 10.

14. A radio receiver array characterised by comprising a plurality of radio frequency receiver circuits according to any preceding claim.

15. A distributed antenna system characterised by comprising an optical fibre including a plurality of radio frequency receiver circuits (2), according to any preceding claim, associated with the optical fibre.

16. A radio frequency circuit (2) comprising: an antenna (8, 28) and is characterised in that a photodiode (10) is connected across the antenna (8, 28) wherein the photodiode (10) is operable to receive a modulated optical signal (12) to provide the local oscillator frequency of the circuit (2) and wherein the capacitance of the photodiode (10) is used to tune the antenna (8, 28).